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## PATENT SPECIFICATION

651,105

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## PROVISIONAL SPECIFICATION.

## Means for Attaching a Metal Tube to Another Element by Casting.

We, AVON DIECASTING COMPANY LIMITED, a British Company, of Era Works, Crompton Road, Nechells, Birmingham 7, in the County of Warwick, and SIDNEY ARTHUR WALTERS, a British Subject, of the Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to means for attaching a metal tube to another element and is applicable to a case in which it is desired to fix a bracket, or a bearing or any other element, on the end of a metal tube. It is also applicable to a case in which two or more tubes have to be connected together, as for instance when making a tubular frame or structure.

One application of the invention is to the frames of cycles wherein the tubes have to be firmly connected together. Hitherto it has been usual in conjunction with cycle frames to use lugs which provide a pair of sockets arranged at an angle to each other, into which sockets the ends of the tubes are secured by brazing. In the case of the bottom bracket the lug has often been formed integrally with the housing for the bottom bearing. In the case of the joint at the forward end of the frame the lug has been formed integrally with a tube forming a bearing for the handle bar tube; and in the case of the joint at the rear end of the frame the lug has comprised two sockets, one of which has been split and provided with a pair of jaws which can be pinched together for fixing the seat pillar.

In all these cases the cost of production is increased very considerably by machining the lugs, brazing, and the necessity of removing surplus brass which adheres to the tubes adjacent to the lug, this operation usually being carried out by filing.

The object of the present invention is to provide improved means for attaching a metal tube to another element, and in the case of frames built-up of tubular members, such for instance as cycle frames, to eliminate the operations of machining, brazing

[Price 2/-]

and filing away surplus brass.

According to the present invention the end portion of the tube is provided with one or more holes extending through the side wall, and a plug having a closed end is inserted in the end of the tube and the element to be attached to the tube is connected to a diecast socket, which is cast around the plugged end of the tube, the diecast metal extending through the hole or holes in the tube and into a hole, groove or recess in the plug.

In applying the invention to a case wherein two tubes are to be connected together, holes are made in the end portions of the tubes extending through the side walls of the tubes, and plugs are inserted in the ends of the tubes, these plugs having closed ends and the plugs having holes, grooves or recesses in their sides which register with the holes in the tubes, and the plugged ends of the tubes are placed in a die which encloses the plugged ends of the tubes for a suitable length, the die having portions engaging around the exteriors of the tubes at positions spaced from the ends of the tubes and the die having annular cavities which extend around the end portions of the tubes. The diecast metal is run or forced into the die and forms sockets enclosing the plugged ends of the tubes, which sockets are firmly united to the tubes and plugs by the metal which has passed through the holes in the tubes and into the holes, grooves or recesses in the plugs. With this arrangement the diecast metal is prevented from flowing down upon the exterior of the tubes by the die, and if a little of the diecast metal does pass on to the exterior surfaces of the tubes this is quickly and easily removed.

The diecasting which unites the tubes together may in the case of a bottom bracket of a cycle frame include a circular bearing housing, and in the case of the forward joint of the frame the diecasting may include an integral tubular part forming the bearing for the steering tube. In the case

of the rear joint of the frame one of the diecast sockets may be split and provided with integral jaws enabling the socket to be contracted by a pinching screw in the well-known way.

Plugs may be used which are closed and flanged at the outer ends, these flanges engaging the ends of the tubes, and each plug having a hollow cylindrical portion which is adapted to be disposed within the tube, and such cylindrical portions may have circumferential grooves which register with the holes in the tubes. These circumferential grooves may be wider than the diameter of the holes in the tubes. The holes in the tubes may be situated in the same plane and a plurality of holes may communicate with the circumferential grooves in the plug.

In another construction the plug is flanged at one end, the flange engaging the end of the tube, and the plug is provided with a cylindrical portion which is solid and which engages in the end of the tube. With this arrangement there may be one, two, three or more series of holes in the tube arranged in different planes, and the plug is provided with diametrically-disposed holes registering with the holes in the tubes, so that

when the diecasting is made the diecast metal passes through the holes in the tubes and fills the holes in the plug.

In another construction the plug is flanged at its outer end and the flange engages the end of the tube. The cylindrical portion of the plug which engages in the tube is provided with holes in its walls which register with the holes in the tube and the cylindrical part of the plug is closed at its inner end but open at its outer end so that the diecast metal in addition to forming the socket and filling the holes in the plug and tube also fills the interior of the plug.

The invention may be used in connection with cycle frames or other tubular structures made of light alloy where brazing or other means of fixing are either difficult or impossible.

Dated the 4th day of November, 1948.

FORRESTER, KETLEY & CO.,

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and

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#### COMPLETE SPECIFICATION.

#### Means for Attaching a Metal Tube to Another Element by Casting.

We, AVON DIECASTING COMPANY LIMITED, a British Company, of Elm Works, Crompton Road, Neechells, Birmingham 7, in the County of Warwick, and SIDNEY ARTHUR WALTERS, a British Subject, of the Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to means for attaching in position the metal tubes in cycle frames. Hitherto it has been usual in conjunction with cycle frames to use lugs which provide a pair of sockets arranged at an angle to each other, into which sockets the ends of the tubes are secured by brazing. In the case of the bottom bracket the lug has often been formed integrally with the housing for the bottom bearing. In the case of the joint at the forward end of the frame the lug has been formed integrally with a tube forming a bearing for the handle bar tube; and in the case of the joint at the rear end of the frame the lug has comprised two sockets, one of which has been split and provided with a pair of jaws which can be pinched together for fixing the seat pillar.

In all these cases the cost of production

is increased very considerably by machining the lugs, brazing and the necessity of removing surplus brass which adheres to the tubes adjacent to the lug, this operation usually being carried out by filing. To eliminate these operations, in one case, it has been proposed to join a handle cross bar to its shank by diecasting a socket round the two tubes, the metal entering holes or indentations in the two tubes.

The object of the present invention is to provide improved means for attaching the metal tubes in position to eliminate the operations of machining, brazing and filing away surplus brass.

According to the present invention the end portion of the tube is provided with one or more holes extending through the side wall, and a plug having a closed end is inserted in the end of the tube and the element to which the tube is to be attached is connected to a diecast socket, which is cast around the plugged end of the tube, the diecast metal extending through the hole or holes in the tube and into a hole, groove or recess in the plug.

The invention is illustrated in the accompanying drawings wherein:—

Figure 1 is a perspective view of the end of a tube and the plug.

Figure 2 is a section showing the attachment of the top tube to the steering column.

Figure 8 is a section on the line 8-8 of Figure 2.

5 Figure 4 shows two alternative methods of attaching tubes to the bottom bracket.

Figure 5 shows a further method this time applied to the attaching of the top tube to the saddle pillar.

10 Figure 6 shows the method of attaching the top tube to the steering column with a modified form of plug.

Figure 7 shows a modified form of the end of a tube.

15 Referring to the drawings Figure 1 shows the end portion of a tube 10 provided with four slots 11 disposed at opposite ends of diameters and one form of plug 12 which is closed at the end 13 and is provided with four axially disposed slits 14 corresponding in position to the slots 11.

20 The slits 14 and corresponding holes 11 in the tube may be spaced at positions other than diametrically opposed.

25 Figure 2 shows the method of attaching the tube 10 which in this case is the top tube of the cycle frame to the steering column 15. The tube 15 is provided with a number of holes 16 and the two tubes 10 and 15 are placed in a suitable die and a removable plug is inserted in the end of the tube 15.

30 The die has portions engaging around the exterior of the two tubes at positions spaced from the end of the tubes and has annular cavities which extend around the end portions of the tubes. The diecast metal is run or forced under pressure into the die and forms the socket 17 which encloses the plugged ends of the tubes and in the case of the tube 10 is firmly united to the tube and plug 12 by the metal which passes through the slots 11 and enters the slits 14 in the plug.

35 40 45 With this arrangement the diecast metal is prevented from flowing down upon the exterior of the tubes 10 and 15 by the enclosing die, and if a little of the metal does pass on to the exterior surfaces of the tubes this is quickly and easily removed.

50 The plug in the end of the tube 15 is then removed, the socket 17 being firmly united by the metal which has entered the holes 16.

55 Figure 5 shows a method of attaching the other end of the top tube 10 to the saddle pillar 18 and in this case an alternative form of plug 19 is shown having holes 20 in its wall and having its exterior hollowed out so that when the diecast metal is introduced into the die it forms the socket 21 and the metal enters the interior of the plug 19.

60 65 Holes 22 are provided in the tube 18 and a removable plug is used as in the previous

arrangement during the casting. In this case the socket 21 is also split and provided with lugs 23 for the reception of the conventional pinch screw.

70 Figure 4 shows the method attaching the two down tubes 24 and 25 to the bottom bracket and in this case the diecast socket 26 also provides a circular bearing housing 27 for the crank shaft. The two bottom tubes 28 are attached to the socket 26 by the same method and in Figure 4 two alternative forms of plug are shown although the plug of Figure 1 or 5 could be equally well used in this case.

80 The plug shown in the tube 24 has circumferential flanges 29 and is closed at the end 30 and its centre portion 31 is of reduced diameter so that the diecast metal enters the annular space 32 to firmly unite the socket 26 to the tube 24.

85 The plug in the tube 25 is substantially solid but is provided with transversely extending holes 33 so that the metal passes through the plug and secures the tube 25 to the socket 26.

90 In the modification shown in Figure 6 the method of diecasting is as shown and described in Figure 2, but the plug used differs in that it is provided with a plurality of circular recesses 34 and the diecast metal flows through a circular opening 35 in the wall of the tube and into the recesses 34 so as to form heads 36 which firmly engage behind the wall of the tube so as to bind the socket to the end of the tube.

100 105 110 With reference to Figure 7 a modification is shown in which the end of the tube is provided with an outwardly projecting circumferential bead 37 and also slots 38. When the socket is diecast around the end of the tube as in any of the previously described methods the bead 37 forms a further connection between the end of the tube and the socket and assists in strengthening the arrangement.

115 Instead of the bead 37 there may be a series of projections around the tube or the bead may be disposed inwardly or indentations may be provided in the wall of the tube. Alternatively the end of the tube may be flanged outwardly to provide extra strengthening of the connection between the socket and the end of the tube.

120 The tubes used for cycle frames may be steel tubes and preferably a zinc base metal is used for the diecast socket. Any convenient metal may be used for the plug but it is preferred to use the same metal as that used for the socket.

125 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. A method of attaching a tube in position in a cycle frame, in which the end por-

- tion of the tube is provided with one or more holes extending through the side wall of the tube, and a plug having a closed end is inserted in the end of the tube and the element to which the tube is to be attached is connected to a diecast socket which is cast around the plugged end of the tube, the diecast metal entering through the hole or holes in the tube and into a hole, groove or recess in the plug.
2. A method according to Claim 1 wherein diametrically opposed holes are provided in the wall of the end portion of the tube and the plug is provided with one or more diametric slits extending axially from one end of the plug.
3. A method according to Claim 1, wherein the plug is of hollow form with one or more holes in its wall so that the diecast metal enters and fills the interior of the plug.
4. A method according to Claim 1 wherein the plug is substantially solid and has one or more holes extending transversely through it.
5. A method according to Claim 1 wherein the plug is provided with a circumferential flange at each end defining between them a portion of reduced section so that the diecast metal can fill the annular space around the reduced portion.
6. A method according to Claim 1 wherein the plug is provided with a plurality of recesses on its outer surface so that the diecast metal enters through the holes in the end of the tube and forms beads within the recesses in the plug.
7. A method according to Claim 1 wherein one or more projections or indentations are made at or near the end of the tube so that the metal of the wall of the tube is displaced inwardly or outwardly.
8. A method according to Claim 7 wherein an outwardly projecting circumferential bead is provided near the end of the tube.
9. A cycle frame in which the top tube is secured in position by providing one or more holes at each end and a plug having a closed end inserted in each end of the tube, the steering column and saddle pillar respectively being connected to diecast sockets which are cast around the plugged ends of the tube, the diecast metal extending through the holes in the tube and into holes, grooves or recesses in the plugs.
10. A cycle frame according to Claim 9 wherein the tube of the steering column, or saddle pillar, is connected to its associated socket by providing holes in the wall of the tube and a removable plug fitting within the tube while the metal is being cast so that diecast metal enters the holes in the wall of the tube to form the connection between the tube and the socket.
11. A method of attaching tubes in position in a cycle frame substantially as described with reference to and as shown in the accompanying drawings.
12. A cycle frame having the tubes attached in position substantially as described with reference to and as shown in the accompanying drawings.

Dated this 14th day of November, 1949.

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and  
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[This Drawing is a reproduction of the Original on a reduced scale.]

